Industrial Waste Management Evaluation Model (IWEM) User's Guide

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FORMAT AND NOTATION

The main font for this document is 12-point *Times New Roman* font. The IWEM command buttons, icons, menu items and other action-controls are shown in 11-point *Arial Narrow* font, with small capitals style and with vertical bars at the beginning and end; for example, |FILE| and |EVALUATION| are two of the menu items contained in the IWEM menu bar. When referring to a sequential series of menu selections, such as "click on File, then click on Open," this sequence of keystrokes is presented as |FILE|OPEN|.

IWEM screen and dialog box titles are presented in underlined text; user-entry labels are using the same format as IWEM menu items and other action-controls; and references to user-supplied text are shown in 12-point *Courier* font. For example, the user could provide `Rodney's Waste Dump` as *Facility Name* in screen Tier 2 Input: WMU Type (17).

The IWEM software is organized into screens and dialog boxes and, for easy reference, these components are labeled using a common numbering scheme. Within the main IWEM program window, there are a number of screens that are displayed one at a time as you move through an IWEM analysis. Each of these screens has a title that tells you what part of the IWEM software you are in; if the IWEM screen is stretched to fill the IWEM program window, then the title bar containing these titles is located directly beneath the IWEM toolbar. Additionally, within some of these screens there are several tabbed screens that resemble tabbed file folders. Each of these tabbed screens has a title (placed on the screen itself) that tells you more specifically what type of information is being requested or displayed on the screen. We refer to all screens and tabbed screens in this document simply as screens. Finally, when you use certain options on the Infiltration (19) and Constituent List (20) screens, dialog boxes are displayed to allow entry of additional information. Each of these dialog boxes has a title (placed on the title bar at the top of the dialog box) that identifies the type of information requested.

Although there are other ways to navigate through the IWEM software, it is anticipated that most users will generally start at the beginning of a Tier 1 or Tier 2 analysis and then move through the screens sequentially using the |NEXT| and |BACK| buttons. In order to facilitate the reporting of user comments and problems, EPA has organized all IWEM components into one common sequential numbering scheme according to the order in which they would be displayed in a typical analysis. Hence, a first-time IWEM Tier 1 user will see the following sequence screens:

- Introductory Screens (screens 1 through 5)
- Tier 1 Input screen group (tabbed screens 6 through 8)

- Tier 1 Results screen group (tabbed screens 9 through 13)
- Tier 1 Evaluation Summary Screen (screen 14)

Similarly, a Tier 2 user will typically see the following sequence of screens and dialog boxes (however, there are some slight differences in this sequence depending upon the WMU type and infiltration option chosen by the user):

- Tier 2 input screen group (tabbed screens 16 through 23, including dialog box 19a that is associated with tabbed screen 19 and dialog boxes 20a to 20d that are associated with tabbed screen 20)
- EPACMTP Run Manager located on the Tier 2 Evaluation Screen (screen 24)
- Tier 2 Output tabs (tabbed screens 25 through 28)
- Tier 2 Evaluation Summary Screen (screen 29)

Please note that the screenshots presented in this *User's Guide* were captured using the following settings to ensure maximum legibility:

- monitor set to 800 x 600 resolution
- large system font
- IWEM program window (parent window) maximized
- IWEM (tabbed) screen (child window) enlarged to its fullest extent

If you use other settings while running IWEM, you may need to use the sliders that appear as necessary on the right and bottom edge of the IWEM windows in order to see the entire screen.

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ACRONYMS AND ABBREVIATIONS

CAS Number	Chemical Abstract Service Registry Number
cm/sec	centimeters per second
CSF	Cancer Slope Factor
DAF	Dilution and Attenuation Factor
EPA	Environmental Protection Agency
EPACMTP	EPA's Composite Model for Leachate Migration with Transformation Products
GUI	Graphical User Interface
Guide	Guide for Industrial Waste Management
HBN	Health-Based Number
HELP	Hydrologic Evaluation of Landfill Performance
HQ	Hazard Quotient
IWEM	Industrial Waste Management Evaluation Model
k_d	Soil - Water Partition Coefficient
K_{oc}	Organic Carbon Partition Coefficient
LAU	Land Application Unit (also called a Land Treatment Unit)
LCTV	Leachate Concentration Threshold Value
LF	Landfill
MB	megabyte
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
mg/L	milligrams per liter
MINTEQA2	EPA's geochemical equilibrium speciation model for dilute aqueous systems
MS	Microsoft™
NPDWR	National Primary Drinking Water Regulation
OSW	EPA's Office of Solid Waste

ACRONYMS AND ABBREVIATIONS (continued)

RAM	Random Access Memory
RCRA	Resource Conservation and Recovery Act
RGC	Reference Ground-Water Concentration
SI	Surface Impoundment
SPLP	Synthetic Precipitation Leaching Procedure
STORET	EPA's Data Storage and Retrieval System, National Water Quality Database
TC Rule	Toxicity Characteristic Rule
TCLP	Toxicity Characteristic Leaching Procedure
U.S. EPA	United States Environmental Protection Agency
WMU	Waste Management Unit
WP	Waste Pile

1.0 Introduction

This document describes how to use the Industrial Waste Management Evaluation Model (IWEM). IWEM is the ground-water modeling component of the *Guide for Industrial Waste Management* (***Guide***) (U.S. EPA, 2002d), which has been developed by the U.S. Environmental Protection Agency's (EPA's) Office of Solid Waste (OSW) for the management of non-hazardous industrial wastes. A companion document, the *Industrial Waste Management Evaluation Model Technical Background Document* (U.S. EPA, 2002c), provides technical background information. It is strongly recommended that you take the time to understand the technical background of IWEM in order to make the best use of this program. This section of the *User's Guide* provides an overview of IWEM and its purpose, operation, and application; describes the major components of the system; and provides an overview of how the remainder of the document is organized.

1.1 Guide for Industrial Waste Management

The EPA and representatives from 12 state environmental agencies have developed a voluntary ***Guide*** (U.S. EPA, 2002d) to recommend a baseline of protective design and operating practices to manage nonhazardous industrial wastes throughout the country. The guidance was designed for facility managers, regulatory agency staff, and the public, and it reflects four underlying objectives:

- Adopt a multimedia approach to protect human health and the environment;
- Tailor management practices to risk using the innovative, user-friendly modeling software provided in the ***Guide;***
- Affirm state and tribal leadership in ensuring protective industrial waste management, and use the ***Guide*** to complement state and tribal programs; and
- Foster partnerships among facility managers, the public, and regulatory agencies.

The ***Guide*** recommends best management practices and key factors to consider to protect ground water, surface water, and ambient air quality in siting, designing and operating waste management units (WMUs); monitoring WMUs' impact on the environment; determining necessary corrective action; closing WMUs; and providing post-closure care. In particular, the guidance recommends risk-based approaches to choosing liner systems and waste application rates for ground-water protection and to

evaluate the need for air controls. The CD-ROM version of the ***Guide*** includes user-friendly air and ground-water models to conduct these risk evaluations. The IWEM software described in this *User's Guide* is the ground-water model that was developed to support the ***Guide***.

1.2 The IWEM Software

The IWEM software is designed to assist you in determining the most appropriate WMU design to minimize or avoid adverse ground-water impacts, by evaluating types of liners, the hydrogeologic conditions of the site, and the toxicity and expected leachate concentrations of the anticipated waste constituents. That is, this software helps you compare the ground-water protection afforded by various liner systems with the anticipated waste leachate concentrations, so that you can determine what minimum liner system is needed to be protective of human health and ground-water resources (or in the case of land application units (LAUs), determine whether or not land application is recommended).

The anticipated users of the IWEM computer program are managers of proposed or existing units, state regulators, interested private citizens, and community groups. For example:

- **Managers of a proposed unit** could use the software to determine what type of liner would be appropriate for the particular type of waste that is expected at the WMU and the particular hydrogeologic characteristics of the site.

- **Managers of an existing unit** could use the software to determine whether or not to accept a particular waste at that WMU by evaluating the performance of the existing liner design.

- **State regulators** may wish to use the software in developing permit conditions for a WMU.

- **Interested members of the public or community groups** may wish to use the software to evaluate a particular WMU and participate during the permitting process.

In an effort to meet the needs of various stakeholders, the guidance for the ground-water pathway uses a tiered approach that is based on modeling the fate and

transport of waste constituents through subsurface soils and ground water to a well[1] to produce a liner recommendation (or a recommendation concerning land application) that protects human health and the environment. The successive tiers in the analysis incorporate increasing amount of site-specific data to tailor protective management practices to the particular circumstances at the modeled site:

- **Tier 1**: A screening analysis based upon national distributions of data;
- **Tier 2**: A location-adjusted analysis using a limited set of the most sensitive waste- and site-specific data; and
- **Tier 3**: A comprehensive and detailed site assessment.

The IWEM software is designed to support the Tier 1 and Tier 2 analyses. The unique aspect of the IWEM software is that it allows the user to perform Tier 1 and Tier 2 analyses and obtain liner recommendations with minimal data requirements. Users interested in a Tier 3 analysis should consult the ***Guide*** for information regarding the selection of an appropriate ground-water fate and transport model.

1.3 Objectives

The objective of this *User's Guide* is to provide the information necessary to perform Tier 1 and Tier 2 analyses for four types of WMUs:

- **Landfills (LFs);**
- **Waste Piles (WPs);**
- **Surface Impoundments (SIs);** and
- **Land Application Units (LAUs)** (which are also called Land Treatment Units).

This *User's Guide* is organized as follows:

- Section 2 provides an overview of the IWEM software;
- Section 3 summarizes the computer system requirements for the IWEM software;
- Section 4 provides instructions for installing the IWEM software;
- Section 5 provides detailed instructions on how to run the IWEM software, and guides you step-by-step through Tier 1 and Tier 2 evaluations;

[1] In IWEM, the term "well" is used to represent an actual or hypothetical ground-water monitoring well or drinking water well, downgradient from a WMU.

- Section 6 presents background information to assist in understanding the Tier 1 and Tier 2 input values; how they affect the model evaluation; and how to obtain input values for a Tier 2 evaluation;
- Section 7 presents background information to assist in understanding the Tier 1 and Tier 2 IWEM results;
- Section 8 provides troubleshooting information for some commonly encountered problems;
- Section 9 lists all references cited;
- Appendix A presents the list of waste constituents included in IWEM; and
- Appendix B presents the Tier 1 and Tier 2 reports for the example evaluations presented in this document.

If you have a copy of the CD, you can open and read this *User's Guide* on-screen while the IWEM software is running on your computer. You may, however, find it easier to use IWEM's online help or to print out a copy of the *User's Guide* and refer to this hard copy while you are using the software.